

Identification of Novel Perfluorinated and Polyfluorinated Compounds in a River Basin

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Project Formulation

Region 4 has had multiple locations with impacts to rivers and community water systems due to the presence of two compounds perfluorooctanoic acid (PFOA) and perfluorooctanesulfonate (PFOS). One of the areas with significant impacts has been the Coosa River watershed where use of per- and polyfluoroalkyl substances (PFAS) by the carpet and other industries has resulted in discharges which have impacted surface water quality and community water systems which use these sources. As a result of EPA OW final Health Advisory for PFOA and PFOS several community systems had to take actions to reduce exposure to these compounds. Although PFOA and PFOS are no longer used there are still legacy impacts from historic usage. However, other PFAS are known to have been substituted for PFOA and PFOS and limited river water analysis focused on carboxylic acids has shown these other PFAS compounds have increased significantly in surface water. River sampling has been conducted in 2008 by ORD (Lasier et al.) and by GA EPD in 2012 and 2016 (unpublished) which was restricted to the carboxylic acids and sulfonates has shown an increase in substitute compounds over time. Unfortunately, the full range of PFAS which may be in water used by communities on the Coosa River is unknown. A recent paper (Newton et al.) has shown in another area in the southeast with discharges of PFAS that surface water has a large number of detectable PFAS with many compounds beyond the legacy carboxylic acids and sulfonates. Although communities have taken measures to address PFOA and PFOS, in finished water supplies, there may be additional compounds for which treatment is not effective in removal. A recent paper by Sun et al., 2016 indicate select novel PFAS are not removed by traditional drinking water processes. Some scientists believe that of the thousands of PFAS, hundreds may be environmentally significant. The first step to understanding which of the other compounds may be of concern is determining which compounds are found in sources of water for community water systems and fish tissue consumed by community members.

Approach

The Coosa River in Georgia and Alabama and its tributaries are known to be impacted by releases from industrial sources which use PFAS. These sources include textile factories and chemical industry sites. Releases are unregulated under the Clean Water Act since there are no aquatic water quality standards. There is an OW drinking water Health Advisory for PFOA and PFOS (combined 70 pptng/L). There is research on the toxicology of both short chained and long chained carboxylic acids as well as information about the half-lives of these compounds in animals and humans. However, little is known about the other PFAS compounds which are likely to be present. Currently, several community water system intakes are known to be impacted by elevated concentrations of carboxylic acids and PFOS. These include Rome community water system (GA1150002 Population served 45,586), Centre Water and Sewer Board (AL0000188 population served 6,108) and Gadsden Water Works and Sewer Board (AL0000577 Population Served 44,637). Additional communities may be impacted if fish with elevated concentrations of PFAS is consumed.

The proposed study will involve the collection of water and fish tissue samples upstream and downstream of potential sources and near community water system intakes. POCIS samplers (Polar Organic Chemical Integrative Sampler) will also be deployed at selected locations to provide information about long-term occurrence. Samples will be analyzed by ORD NERL. Once the analytical data is available, Region 4 staff will create GIS maps of PFAS detected. The maps will be imported into C-FERST SHC tool so that potentially impacted communities with intakes on the river can be classified by percent below poverty level, percent below 5 years of age, percent greater than 64, percent linguistically isolated households, and percent low income households.

Samples are expected to be collected within approximately three months after the approval of the project. Analysis and reporting of data for water and fish is expected to take approximately four months. GIS mapping and use of C-FERST will take approximately one month.

Expected Results

As a result of this project, there will be information about which compounds are present in rivers and fish tissue which potentially may adversely impact communities with intakes on river systems and which consume fish for food sources. With this information it will be possible to focus research on chemicals which are actually present and may potentially be of concern to communities. Also, there will be information about the impacted communities so that their concerns and issues may be better understood. The staff at ORD will use the data and information from this project as the subject matter of publications. EPA will benefit because there will be a better understanding of what other PFAS compounds may be of concern. Region 4 will benefit because there will be a more complete understanding of the full impacts of PFAS on communities in the Coosa River watershed.

Project Budget and Management

The project will need \$150,000 to support the work done at ORD NERL. Samples will be collected by EPA Region 4 SESD and/or GA EPD. GIS analysis of data will be conducted by Region 4 staff. It is expected to require ½ FTE from ORD for the analytical work. The sample collection will require two to three weeks. The GIS analysis will require approximately one month.

Citations

Newton, Seth; McMahan, Rebecca; Stoeckel, James; Chislock, Michael; Lindstrom, Andrew; and Strynar, Mark, in press, Environmental Science and Technology, Novel polyfluorinated compounds identified using high resolution mass spectrometry downstream of manufacturing facilities near Decatur, Alabama, USA

Lasier, Peter J.; Washington John W.; Hassan, Sayed M.; and Jenkins, Thomas M., 2011, Perfluorinated Chemicals in Surface Water and Sediments from Northwest Georgia, USA, and their Bioaccumulation in *Lumbriculus Variegatus*, Environmental Toxicology and Chemistry, vol. 30, no. 100, pp. 2194-2301.

Mei Sun, Elisa Arevalo, Mark Strynar, Andrew Lindstrom, Michael Richardson, Ben Kearns, Adam Pickett, Chris Smith, and Detlef R. U. Knappe. Legacy and Emerging Perfluoroalkyl Substances Are Important Drinking Water Contaminants in the Cape Fear River Watershed of North Carolina Environmental Science & Technology Letters 2016 3 (12), 415-419 DOI: 10.1021/acs.estlett.6b00398